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A Review of the Lizard Genus *Barisia*

BY

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ABSTRACT.—The generic name *Barisia* is revived for a group of lizards that in recent years has been placed in the genus *Gerrhonotus*. The following species and subspecies are recognized: *Barisia moreleti moreleti*, *B. m. temporalis*, *B. m. salvadorensis*, *B. m. fulva*, *B. m. rafaeli*, *B. m. monticola*, *B. viridiflava*, *B. gadovii gadovii*, *B. g. levigata*, *B. modesta*, *B. antauges*, *B. rudicollis*, *B. levicollis*, *B. imbricata imbricata*, *B. i. ciliaris*, *B. i. planifrons*.

The various groupings within the genus are discussed. Brief descriptions are given of all the forms with their present known distribution.

A review of the lizard genus *Barisia*

BY

J. A. TIHEN

The genus *Barisia* was proposed by Gray in 1838 to contain three species formerly included in the genus *Gerrhonotus* Wiegmann; these species were *B. rudicollis*, *B. imbricata*, and *B. lichenigera*; *B. adspersa* was included as a synonym of the last-named species. The same arrangement appeared in his 1845 Catalogue, but he there changed the spelling from *Barisia* to *Barissia*; this emended spelling has incorrectly been used by all subsequent authors.

This genus has been recognized as valid by some authorities, relegated to the synonymy of *Gerrhonotus* by others, and considered as a subgenus of *Gerrhonotus* by yet others. It was redefined by Cope in 1877 on the basis of the arrangement of the "internasal" and frontonasal elements. He recognized five species: *antauges*, *bocourti*, *lichenigera*, *imbricata*, and *rudicollis*. In the same work he proposed the genus *Mesaspis* for two forms, *moreleti* and *fulvus*. Most authors have never considered this latter a valid genus, al-

though Cope still recognized it in 1900; recent workers have also tended to return *Barisia* to the synonymy of *Gerrhonotus*.

I have recently * set forth my reasons for believing that *Barisia* should be considered a valid and recognized genus of gerrhonotine lizards, and have redefined the genus as shown below. A discussion of the genus as a whole, in relation to other gerrhonotine genera, is to be found in the previous paper; the present paper deals with the forms and interrelationships within the genus.

I wish to express my appreciation for the many helpful suggestions and criticisms offered during the course of my study and the preparation of this paper by Dr. S. C. Bishop of the University of Rochester and Dr. Hobart M. Smith of the University of Illinois, also by Dr. E. R. Dunn of Haverford College and Drs. L. C. Stuart and Norman Hartweg of the University of Michigan. The following individuals have been very generous in lending personal specimens, or specimens under their care in the institutions with which they are connected: Dr. Doris M. Cochran of the U. S. National Museum, Mr. Charles M. Bogert of the American Museum of Natural History; Mrs. Helen T. Gaige and Dr. Norman Hartweg of the University of Michigan, Dr. Edward H. Taylor of the University of Kansas, Mr. Karl P. Schmidt of the Chicago Natural History Museum, Sr. Rafael Martín del Campo of the Instituto de Biología of Mexico, Mr. R. T. Moore of the California Institute of Technology, Mr. Arthur Loveridge of the Museum of Comparative Zoölogy, and Dr. E. R. Dunn of the Philadelphia Academy of Natural Sciences.

The following abbreviations will be used throughout this paper in reference to the various collections examined:

- AMNH American Museum of Natural History.
- ANSP Academy of Natural Sciences of Philadelphia.
- CNHM Chicago Natural History Museum.
- EHT-HMS Personal collection of Dr. Edward H. Taylor.
- IBM Instituto de Biología de Mexico.
- MCZ Museum of Comparative Zoölogy.
- RTM Personal collection of R. T. Moore.
- TAM Texas A & M College.
- UMMZ University of Michigan Museum of Zoology.
- USNM United States National Museum.

* Amer. Mid. Nat. 1949 in press.

Barisia Gray

Barisia Gray, 1838, Ann. Mag. Nat. Hist., ser. 1, 1:390.

Tropidogerrhonotus Fitzinger, 1843, Syst. Rept.:21. (genotype—*rudicollis*)

Barissia Gray, 1845, Cat. Spec. Liz. Coll. Br. Mus.:54.

Tropidogerrhum Agassiz, 1846, Nomencl. Zool., Ind. Univ.:203. (genotype—*rudicollis*)

Mesaspis Cope, 1877, Proc. Amer. Philos. Soc., 17:96. (genotype—*moreleti*)

Genotype: Gerrhonotus imbricatus Wiegmann, 1828 [= *Barisia imbricata imbricata* (Wiegmann)].

Definition: Gerrhonotine lizards with the skull not widened or depressed; frontal bone not in contact with the maxillae; pterygoid teeth absent or vestigial; dorsal osteoderms with a well-defined, strongly thickened basal area; lateral fold moderately to well developed, with a moderate or large granular area; sides of the neck finely granular; postero-ventral surfaces of the forearms and shanks granular; minimum number of scales in a single row across the nape six to ten; anterior internasals present; postrostral present or absent; subocular and postocular series well differentiated from each other; the suboculars extend to the lowest primary temporal; twelve to fourteen ventral scale rows.

Range: Panamá northward through Central America and México to Chihuahua and Coahuila.

A full description of the genus may be found in my previous paper referred to above; it will not be repeated here.

There are three major lines of specialization within the genus; these have given rise to three species groups, which may be defined very briefly as follows:

1. Postmental unpaired; superciliary series usually complete *moreleti* group
2. Postmental paired; superciliary series complete... *gadovii* group
3. Postmental paired; superciliary series incomplete *imbricata* group

A KEY TO THE FORMS OF THE GENUS *Barisia*

1. Postmental unpaired (nasal bones in contact)..... 2
- Postmental paired; (nasal bones separated by fronto-premaxillary contact)..... 8
2. Eighteen to twenty longitudinal dorsal scale rows..... 3
- Fourteen to sixteen longitudinal dorsal scale rows..... 7
3. Upper and lower postnasals in contact..... 4
- Upper postnasal separated from lower by a loreo-nasal contact..... *moreleti rafaeli*
4. Lowest primary temporal usually in contact with only the lowest secondary; prefrontals usually absent; posterior loreal usually not in contact with the supralabials 5
- Lowest primary temporal usually in contact with the two lower secondaries; prefrontals usually present; posterior loreal normally in contact with the supralabials 6
5. Anterior superciliary element frequently in contact with prefrontal; frontonasal usually touching frontal; 52-58 dorsal scale rows..... *moreleti temporalis*

- Anterior superciliary element not in contact with prefrontal; frontonasal usually separated from frontal by prefrontals; 47-55 dorsal scale rows.....
moreleti salvadorensis
6. Anterior sublabial usually in contact with the second infralabial; general color frequently brownish*moreleti fulva*
 Anterior sublabial usually in contact with only the third, or more posterior, infralabial; general color usually olive to blackish.....*moreleti moreleti*
7. Usually 16 dorsal scale rows; frontonasal present, large.....*monticola*
 Fourteen dorsal scale rows; frontonasal normally absent.....*viridiflava*
8. Superciliary series complete; (pterygoid teeth absent)..... 9
 Superciliary series incomplete; (pterygoid teeth vestigial)..... 12
9. Supranasals unexpanded; an anterior canthal present..... 10
 Supranasals expanded; no anterior canthal..... 11
10. Scales of neck keeled; anterior loreal in contact with anterior canthal.....*gadovii gadovii*
 Scales of neck smooth; anterior loreal separated from anterior canthal by a contact of the posterior loreal with the upper postnasal.....*gadovii levigata*
11. Frontonasal and postrostral present.....*modesta*
 No frontonasal or postrostral.....*antauges*
12. One loreal; more than 33 dorsal scale rows..... 13
 Two loreals; fewer than 33 dorsal scale rows.....*rudicollis*
13. More than one (usually three) superciliaries; transverse dorsal scale rows fewer than 46 14
 A single (middle) superciliary element; transverse dorsal scale rows 46 or more...
levicollis
14. Fewer than 16 longitudinal dorsal scale rows; contact of the anterior superciliary with the loreal usually smaller than that of the first medial supraocular with the loreal*imbricata imbricata*
 Sixteen longitudinal dorsal scale rows; contact of the anterior superciliary with the loreal as great or greater than that of the first medial supraocular with the loreal 15
15. Lowest primary temporal in contact with the penultimate as well as the antepenultimate supralabial; 39-45 transverse dorsal scale rows.....*imbricata ciliaris*
 Lowest primary temporal not in contact with the penultimate supralabial; 35-39 transverse dorsal scale rows.....*imbricata planifrons*

The *moreleti* group

Definition: *Barisia* with an unpaired postmental; nasal bones in contact with each other in the mid-dorsal line; pterygoid teeth absent; small lizards, the snout-vent length never exceeding 95 mm., usually much less; dorsal color dark olive brown or brown to blackish, with a more or less well-defined dorsal longitudinal band; venter usually spotted or mottled with dark; superciliary series usually complete; upper postnasal present; loreo-canthal series variable; frontonasal and postrostral present or absent; lateral fold moderately developed.

Range: Panamá northward to Oaxaca.

Discussion: The possession of an unpaired postmental is a universal characteristic of the group. The nasal bones are known to be in contact in *viridiflava* and *m. moreleti*; this is assumed to be the condition in the other members. Some examples of all species (but not of all subspecies) have been examined to determine the condition of the pterygoid, and in all cases the pterygoid teeth were completely lacking.

These are the smallest of all the Gerrhonotinae; the largest species of the group is *moreleti* itself, with a maximum observed snout-vent length of 92 millimeters. *B. viridiflava* is the smallest form, with an observed maximum of 71 mm. The color pattern, though varying in detail, is basically similar in all members of the group. A similar type of pattern is found in the *gadovii* group, but the *imbricata* group is, in general, much lighter, with a strong tendency towards obliteration of the dorsal longitudinal band.

The arrangement of the lateral supraoculars and the superciliary series merits some discussion. In the majority of specimens of *moreleti* there are three lateral supraoculars and a normal, complete superciliary series. In *viridiflava* and *monticola* the usual condition appears to be the possession of only two lateral supraoculars, with the superciliary series complete and the most posterior element occasionally somewhat enlarged. In some specimens of *moreleti* and *monticola* an arrangement is found which appears very similar, but which seems better interpreted as a loss of the posterior part of the superciliary series, the third lateral supraocular dropping down to contact the orbit. A very similar condition is found throughout the *imbricata* group. Neither interpretation—the loss of the posterior superciliaries or the loss of the third lateral supraocular with an enlargement of the most posterior superciliary—adequately accounts for all the conditions found. I have used the latter interpretation to explain the arrangement as found in *viridiflava*, the former to explain the slightly different one found occasionally in other members of this group and universally in the *imbricata* group. Possibly neither is entirely correct.

In the present group, the upper postnasal is always present, although not necessarily in contact with the lower. The supranasal is variable, usually present and unexpanded, but sometimes absent in certain forms, and occasionally expanded in others. The loreocanthal group is quite variable in *moreleti* itself but usually containing at least three elements, while in other species, only one or two elements are usually present.

The group as a whole shows a strong tendency towards enlargement of the frontonasal, with corresponding reduction of the posterior internasals and, more particularly, the prefrontals; these latter are in some cases completely lacking, either dropped out or fused with the enlarged frontonasal. In one form, *viridiflava*, modification has been in the opposite direction; the frontonasal is absent or, in those exceptional individuals where it does occur, is

relatively small. The postrostral is normally lacking in all forms, but appears in occasional specimens of *viridiflava*.

The dorsal osteoderms are rather thin, slightly rugose, with a strongly thickened basal portion and a rather weak and obtuse median keel. The lateral fold is only moderately developed, the included granular area being about equivalent to one lateral scale row in width. The side of the neck contains a very poorly-defined dermal pocket or none at all.

The *moreleti* group, particularly the species *moreleti*, is thought to be the most primitive of the genus. The unpaired postmental, reduction of the prefrontals, and complete lack of pterygoid teeth are modifications not found in the primitive *Barisia* stock, but in totality of characters this group approaches that stock more closely than does any other.

I do not at present propose to enter into great detail regarding subspecific differentiation within the species *Barisia moreleti*. There is much individual variation in this form, and the localities from which collections of series of individuals have been made are so scattered that areas of intergradation cannot yet be definitely established. The taxonomic arrangement is therefore far from settled, and I prefer to give at present only a brief resumé of those forms which I believe to be valid subspecies.

Barisia moreleti moreleti (Bocourt)

Gerrhonotus moreleti Bocourt, 1871, Nouv. Arch. Mus., 7, Bull.:102.

Gerrhonotus moreletii, Bocourt, 1871, *ibid.*:103.

Mesaspis moreletii, Cope, 1877, Proc. Amer. Philos. Soc., 17:96.

Gerrhonotus [moreletii] moreletii, Dunn and Emlen, 1932, Proc. Acad. Nat. Sci. Philad., 84:29.

Type and type locality: A series of specimens presumably in the Paris Museum. From "le Pcten, ainsi que les forêts de pins de la Haute Vera-Paz (Guatémala)."

Range: Alta Verapaz, Guatemala, westward possibly to, but not beyond, the Cuchumatanes, and southward into Honduras, where presumed intergrades with *salvadorensis* are found.

Diagnosis: A *Barisia* of the *moreleti* group with 18-20 longitudinal rows of dorsals; transverse rows of dorsals 49-56; lowest primary temporal in contact with only the lowest secondary; supranasals present, unexpanded; frontonasal present, large, usually in contact with the frontal; prefrontals usually absent; upper and lower postnasals in contact with each other; anterior superciliary not in contact with prefrontal (when present); posterior loreal usually separated from the supralabials; sublabial series usually

extending anteriorly only to the third or a more posterior infralabial; dorsal color usually dark brown or olive brown to blackish; venter usually relatively dark in color, with a rather conspicuous light V-shaped marking on the chin.

Barisia moreleti fulva (Bocourt)

Gerrhonotus fulvus Bocourt, 1871, Nouv. Arch. Mus., 7, Bull.:104.

Mesaspis fulvus, Cope, 1877, Proc. Amer. Philos. Soc., 17:96.

Gerrhonotus moreletii fulvus, Stuart, 1943, Occ. Pap. Univ. Mich. Mus. Zool., No. 471:20.

Type and type locality: A series in the Paris museum; from "les forêts de pins de Totonicapan (Guatemala)."

Range: Northwestern Guatemala, the limits of the range not established. Specimens from the Sierra de los Cuchumatanes are not fully typical of this form; they may possibly represent three-way intergradation—*moreleti*, *m. fulva* and *m. temporalis*, but they also present certain unique characteristics, indicating that the situation may be even more complex.

Diagnosis: Similar to *B. m. moreleti*, except: transverse rows of dorsals 50-59; sublabial series usually extending anteriorly to touch the second infralabial; color generally somewhat lighter, more brownish dorsally; venter also somewhat lighter, therefore the V-shaped marking on the chin less conspicuous.

Note: If the locality data concerning the type are correctly given by Bocourt, the name *fulva* seems the most likely name for this western Guatemala subspecies. However, the figure of this form subsequently published by him in his "Mission Scientifique," Pl. 21b, figs. 6, 6a, shows certain features definitely not characteristic of the population to which the name is here assigned. Since these features were not mentioned in the original description, further study is required to determine whether or not the figure actually represents one of the type series of *fulva*, and if so, whether it is only an aberrant individual or is typical of that series, and whether or not the locality data are correct, before a certain assignation of the name can be made. Since this certain assignation cannot be made at present, I believe it will cause the least confusion to continue, for the present, to apply this name to the western Guatemala form.

Barisia moreleti rafaeli (Hartweg and Tihen)

Gerrhonotus moreleti rafaeli Hartweg and Tihen, 1946, Occ. Pap. Univ. Mich. Mus. Zool., No. 497:8.

Type and type locality: UMMZ 88228; a young female from 16 km. S of Siltepec, Chiapas.

Range: The southern Sierra de Chiapas. Known from the following localities: 16 km. S of Siltepec, Chiapas (UMMZ 88227-88228), Cerro Paxtal (UMMZ 88384), Chiquihuite, Volcán de Tacaná (UMMZ 88384), Cerro Malé (UMMZ 94290), and Volcán Tajumulco, Guatemala (CNHM 20308-20310).

Diagnosis: Similar to *B. m. moreleti* except: dorsals in 50-55 transverse rows; prefrontals present; upper and lower postnasals separated from each other by the anterior loreal, which is in contact with the nasal; posterior loreal in contact with the supralabials; V-shaped marking on chin less distinct, the marking itself being darker than in *m. moreleti*.

Barisia moreleti salvadorensis (Schmidt)

Gerrhonotus salvadorensis Schmidt, 1928, Field Mus. Nat. Hist. Zool. Ser., vol. 12, no. 16, 196.

Gerrhonotus moreletii salvadorensis, Dunn and Emlen, 1932, Proc. Acad. Nat. Sci. Philad. 84, p. 28.

Type and type locality: CNHM 10957; an adult female from Los Esesmiles, dept. Chalatenango, Salvador.

Range: Honduras and Salvador southward to Matagalpa, Nicaragua.

Diagnosis: Similar to *B. m. moreleti*, except: transverse rows of dorsals 47-55; lowest primary temporal usually in contact with the two lowest secondaries; frontonasal usually separated from the frontal by the prefrontals, which are consistently present; posterior loreal in contact with the supralabials; sublabials extending anteriorly to touch the second infralabials.

Barisia moreleti temporalis (Hartweg and Tihen)

Gerrhonotus moreleti temporalis Hartweg and Tihen, 1946, Occ. Pap. Univ. Mich. Mus. Zool., No. 497:10.

Type and type locality: UMMZ 94910; an adult male, collected 11 km. southeast of Ciudad de las Casas, Chiapas.

Range: Known only from the vicinity of Ciudad de las Casas, Chiapas.

Diagnosis: Similar to *B. m. moreleti*, except: 52-58 transverse rows of dorsals; lowest primary temporal usually in contact with the two lowest secondaries; prefrontals present, sometimes separating frontonasal from frontal; anterior superciliary frequently in contact with prefrontal; posterior loreal in contact with the supralabials; sublabials extending anteriorly to the second infralabial; dorsal and ventral coloration both decidedly lighter in tone, the

V-shaped chin marking less conspicuous because of the lighter background.

General remarks: The species *moreleti* is the most generalized member of the group, and of the genus *Barisia*. This is demonstrated by the high number of dorsal scale rows, the possession of three lateral supraoculars and a complete superciliary series, the relatively large number of loreo-canthal elements, and the general coloration. There are, of course, certain features considered as highly modified, particularly the reduction or loss of the prefrontals and, in common with the other members of the group, the complete lack of pterygoid teeth and the possession of a single postmental.

Barisia monticola (Cope)

Plate II, figs. 1, 2

Gerrhonotus monticolus Cope, 1877, Proc. Amer. Philos. Soc., 17:97.

Gerrhonotus alfaroi Stejneger, 1907, Proc. U. S. Nat. Mus., 32 no. 1542:505. (Type locality: Santa María [de Dota], Costa Rica.)

Type and type locality: In the collection of the U. S. National Museum; number not designated by Cope. From the summit of Pico Blanco in Costa Rica.

Range: The mountains of western Costa Rica south to Chiriquí, Panamá.

Diagnosis: A *Barisia* of the *moreleti* group with sixteen longitudinal rows of dorsals (the most lateral occasionally much reduced); transverse rows of dorsals 43-51; supranasals present or absent; frontonasal present; prefrontals present, often much reduced, or occasionally absent.

Description: No postrostral. Nasal normally separated from rostral by the anterior internasals. Supranasals usually absent. Frontonasal present, large, in contact with the frontal or not; prefrontals usually present, often much reduced. Loreo-canthal region variable, but seldom more than two elements present. One preocular; two or three suboculars; two to four postoculars. Three to five superciliaries, the series complete posteriorly, with the posterior element frequently much enlarged; two, sometimes three, lateral supraoculars. Four primary and four secondary temporals, the uppermost primary in contact with the uppermost secondary or not, and the lowest primary normally in contact with only the lowest secondary, occasionally the two lowest. Supralabials 8-10; infralabials 7-9. Postmental unpaired, followed by three large pairs and one smaller pair of chin shields, of which the members of the first, occasionally also the second, pair are in contact along the mid-

ventral line. The sublabials extend anteriorly to the first chin shields (rarely the postmental) and the second infralabials.

Dorsals in sixteen longitudinal rows, the most lateral occasionally reduced, and 43-51 (ave. 47.7) transverse rows. Ventrals in twelve longitudinal and 51-57 (ave. 53.9) transverse rows. Caudal whorls 78-87 (ave. 83.1). The median six or eight rows of dorsals are rather weakly and obtusely keeled.

There is a marked sexual dimorphism in the color pattern. Males black or brownish-black dorsally, with many small bluish-white spots (green in life), these spots somewhat larger and more distinct dorsally than laterally, producing a poorly defined dorsal longitudinal band. A latero-dorsal dark line bordering this band, and an interrupted mid-dorsal dark stripe. Ventral surface mottled (yellow green in life), the chin and throat frequently lighter than the belly; a more or less distinct V-shaped mark along the chin shields. Females a much lighter brown, with the whitish spots less numerous or lacking. The dorso-lateral dark line is very prominent, often bordered above by a narrow light line. A similarly prominent interrupted mid-dorsal stripe. Belly much lighter than in males, tending towards a uniform grayish and not prominently mottled.

These are small lizards, averaging around 78 mm. in snout-vent length; the observed maximum is 87 mm. Tail 1.58-1.68 times the snout-vent length.

Remarks: This species shows certain resemblances to *B. moreleti*, but differs from that species in the smaller number of dorsal scale rows, both transverse and longitudinal, and in color pattern, particularly of the males. It also differs in the frequent absence of supranasals. Although the loreo-canthal region is somewhat variable within both species, there is a definite tendency for *monticola* to possess a smaller number of elements in this region. The number of supralabials is, in *monticola*, most frequently nine, in *moreleti* most frequently ten. In view of the lack of intergrading specimens and the fairly numerous and constant differences between *monticola* and all races of *moreleti*, it seems best for the present to retain full specific rank for *monticola*.

Certain variable features within this species give indications that they may possess geographic significance. The presence or absence of supranasals and the contact or lack of a contact of the uppermost primary with the uppermost secondary temporal may also prove to have geographic significance. Material at present avail-

able, is however, inadequate to conclusively demonstrate the existence of more than one race.

Specimens examined: Costa Rica: Barba (MCZ 28077-28078); Irazú (MCZ 15465, 15468, 32079); Poas (MCZ 15466-15467); Cerro de las Vueltas (USNM 70649); Volcán Irazú (20) 8,000-10,000 ft.; Volcán Poas (3) 6,300 ft. Cerro de la Muerte (1) 11,000 ft. (uncatalogued specimens). Specimens have also been reported from Pico Blanco and Santa María, Costa Rica. Panamá: Chiriquí Volcano (MCZ 45664; USNM 94991).

Barisia viridiflava (Bocourt)

Figure 1

Gerrhonotus viridiflavus Bocourt, 1873, Ann. Sci. Nat., ser. 5, 17, art. 2 (unpaged).

Gerrhonotus bocourti Peters, 1877, Monatsber. K. Preus. Akad. Wiss. Berlin, 1876:297. (Type locality: "Mexico.")

Barissia bocourti, Cope, 1877, Proc. Amer. Philos. Soc., 17:97.

Gerrhonotus obscurus Günther, 1885, Biol. Centr. Amer., Rept.: 40. (Type locality: "Mexico.")

Type and type locality: In the Paris Museum, number unknown. The locality is given merely as "Mexique," but in view of the present known distribution, I propose to restrict the type locality to "the highlands of central Oaxaca."

Range: Highlands of central Oaxaca.

Diagnosis: A *Barisia* of the *moreleti* group with fourteen longitudinal rows of dorsals; transverse rows of dorsals 48-54; supra-

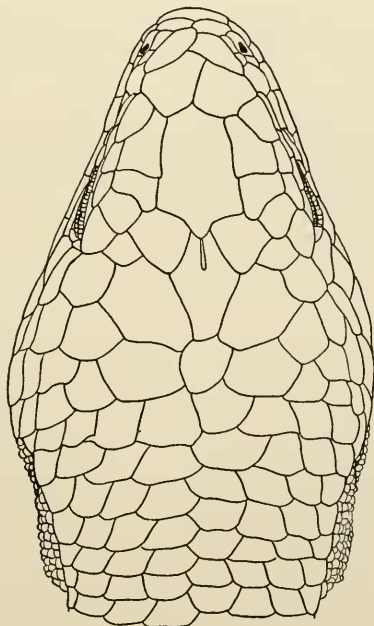


FIG. 1. *Barisia viridiflava* U. S. National Museum no. 113220. Actual snout to ear measurement—13.8 mm.

nasals present, expanded or not; frontonasal normally lacking; prefrontals present, not reduced in size.

Description: Postrostral present or absent; occasionally two anterior internasal elements present on each side. Supranasals present, occasionally expanded to meet the postrostral (when present) or, more rarely, to meet each other in the mid-dorsal line. Frontonasal normally absent, rarely present. One loreal; no canthals. The usual arrangement of the scales above the eye is interpreted as follows: two lateral supraoculars; the superciliary series is complete, with the most posterior element usually somewhat enlarged. Three to five superciliaries, the most anterior only rarely in contact with the prefrontal. Suboculars two; postoculars three. Normally four primary and four secondary temporals, the uppermost primary occasionally in contact with the uppermost secondary, more frequently not, and the lowest primary in contact with only the lowest secondary. Nine, occasionally eight, supralabials; seven or eight infralabials. Postmental unpaired, followed by three large pairs and one much smaller pair of chin shields, of which the members of the anterior pair are in contact mid-ventrally; the members of the second pair are frequently in contact with each other posterior to a single small median scale intercalated between these and the first pair. The sublabials extend anteriorly to the first chin shield and second infralabial.

Dorsals in fourteen longitudinal and 48-55 (av. 51.6) transverse rows; ventrals in twelve longitudinal and 55-61 (av. 57.9) transverse rows. Caudal whorls 83 and 87 in the only two specimens seen with undamaged tails. The median six or eight rows of dorsals are rather weakly keeled.

Color pattern similar in general to that of *B. m. moreleti*, but with great variation in details. The dorsal longitudinal band may be very prominent or very poorly defined; the sides may show very many or practically no white-tipped scales; the belly is usually very dark, but occasionally a very light gray, and may be strongly mottled or nearly uniform. These variations do not seem to be correlated with age, sex, or locality, excepting that the Mt. Zempoaltepec specimens have, on the whole, a better defined pattern, with stronger contrasts between the various elements, than do specimens from other localities.

This is the smallest of all the gerrhonotine lizards, adults averaging slightly over 60 mm. in snout-vent length, with an observed maximum of 71 mm. Tail 1.55-1.67 times the snout-vent length.

Remarks: Since the characters presumably distinguishing the three forms, *viridiflava*, *bocourti* and *obscurus* are all found in a single series of specimens from a single locality (Cerro San Felipe), and since specimens from other localities show no evidence of any geographic significance in these variations, I consider the three names synonymous, with *viridiflava* having priority.

The species is certainly a member of the *moreleti* group, but differs rather widely from the other members, and is considered to be the most highly modified form in the group. The low number of longitudinal dorsal scale rows, the constant absence of all but one loreo-canthal element, the small size, the usual absence of the frontonasal, the usual occurrence of only two lateral supraoculars, and the relatively low number of supralabials are all considered specialized characters, and are the ones which serve to distinguish this form from the other members of the group.

Specimens examined: Oaxaca. Mt. Zempoaltepec (RTM 394, 403-404, 406; USNM 47184-47185, 47599); Cerro San Felipe (EHT-HMS 19146-19149, 23810-23835); Chivato (EHT-HMS 28133-28134); Cuicatlan (USNM 47612). A total of forty specimens; no other specimens with definite locality data have been reported.

The *gadovii* group

Definition: *Barisia* with a paired postmental; nasal bones separated from each other by a narrow contact of the frontal with the premaxilla; lizards of small to moderate size, not exceeding 110 mm. in snout-vent length; coloration similar to that of the *moreleti* group, but with a greater tendency for vertical bars along the sides, occasionally continued across the back; superciliary series complete; upper postnasal present; usually (?) two loreals; an anterior canthal may or may not be present; frontonasal and postrostral present or not; lateral fold moderately developed.

Range: Southern Guerrero through Oaxaca to Veracruz.

Discussion: I have chosen to term this group the *gadovii* group, rather than assign to it the older name of *antauges*, because the latter form is so poorly known that its affinities are uncertain. It has been tentatively referred to this group on the basis of its possession of a paired postmental; the same is also true of *B. modesta*. Since these forms are so inadequately known, the group has been defined chiefly on the basis of the species *gadovii*. Further information concerning these other forms may require a modification of this definition, or may show that they have been incorrectly assigned to this group.

The *gadovii* group is in many respects intermediate between the

moreleti and *imbricata* groups, morphologically, as well as geographically. It possesses the relatively liberal scalation and general color pattern of the former, and also resembles that group in the relatively weak development of the lateral fold and the complete lack of pterygoid teeth. It agrees with the *imbricata* group in the possession of a paired postmental and in the important osteological feature of the separation of the nasals by a fronto-premaxillary contact, though this separation is narrower here than in the *imbricata* group. In size and color pattern it is also more or less intermediate between the other two, but closer to the *moreleti* group.

Barisia gadovii gadovii (Boulenger)

Gerrhonotus gadovii Boulenger, 1913, Ann. Mag. Nat. Hist., ser. 8, 12:564.

Type and type locality: A series of specimens in the British Museum, no holotype designated. This series is from Omilteme, Guerrero.

Range: Known only from the vicinity of Omilteme, Guerrero, but possibly ranging southward into Oaxaca.

Diagnosis: A *Barisia* of the *gadovii* group with a frontonasal; supranasals small, unexpanded; lateral scales as well as dorsal scales of body keeled; those of neck also with keels; usually two loreals and one (anterior) canthal, the latter in contact with the anterior loreal; belly spotted or mottled with black; dorsal color a dark brownish gray or brownish black.

Description: Postrostral present or absent. Supranasals present, small, unexpanded. Frontonasal present, in contact with the anterior canthal and often with the frontal. Two loreals and one (anterior) canthal, the latter normally in contact with the anterior loreal. Normally three lateral supraoculars. Superciliaries three to six, the most anterior not in contact with the prefrontal. Usually one preocular, one subocular, and two or three postoculars. Four primary and four secondary temporals, the uppermost primary usually in contact with the uppermost secondary, and the lowest primary with only the lowest, occasionally also the second, secondary. Supralabials 8-10; infralabials 7-9. Postmental paired, followed by three large pairs and one smaller pair of chin shields, of which the members of the first pair, frequently also the second, are in contact along the mid-ventral line. The sublabials extend anteriorly to the first chin shields and second infralabials, occasionally the postmental and/or first infralabial.

Dorsals in 16-18 longitudinal and 46-51 (ave. 48.4) transverse

rows; ventrals in twelve longitudinal and 52-56 (ave. 53.9) transverse series. Occasionally some of the transverse rows of ventrals contain only ten or eleven scales. Caudal whorls 78-88 (ave. 84.2). Usually all or nearly all of the dorsal scales are prominently keeled, as are those of the sides of the tail and one or two rows on the thigh and on the shank.

A dark brownish gray or brownish black dorsally, often with a more or less distinct longitudinal band. Narrow vertical black bars on the sides, usually bordered posteriorly with white; these bars may be continued across the back as obtusely V-shaped markings. There are about twelve such bars between the axilla and the groin. Venter heavily spotted or mottled with black in males, lightly in females. A dark line from the nasal across the eye onto the temporals, bordered below by a very prominent light stripe.

This form is of moderate size, adults averaging about 90 mm. in snout-vent length, the observed maximum being 102 mm. Tail 1.44-1.72 (ave. 1.59) times the snout-vent length.

Remarks: The species *gadovii* does not appear to be particularly closely related to any other. Oaxacan specimens represent a different form, but are thought to constitute a subspecies of *gadovii* rather than a distinct species; differences are discussed in connection with that form.

There is a slight superficial resemblance between this form and *Elgaria multicarinata* of the United States Pacific Coast. Some *multicarinata* reported from "Mexico" may well be referable to this form. In this connection, there can be little doubt that the figure of a skull in Bocourt's "Mission Scientifique" (Pl. 21c, fig. 7, 7a) and labelled "multicarinata" actually represents a specimen of *gadovii*.

Specimens examined: Guerrero: Omilteme and Chilpancingo (USNM 47737, 113173-113174; MCZ 42701-42715; EHT-HMS 23849-23876; CNHM 38516-38524). A total of fifty-six specimens. The form is not known from any other locality.

Barisia gadovii levigata, subsp. nov.

Plate II, figs. 3, 4, 5.

Type and type locality: Holotype: USNM 47212; an adult male from the "Valley of Oaxaca." Paratype: USNM 47855; an adult male from the "mountains west of Oaxaca City." Nelson and Goldman colls.

Range: Known only from the localities mentioned above.

Diagnosis: A *Barisia* of the *gadovii* group with a frontonasal; supranasals small, unexpanded; scales of the sides of the body

smooth, those of the back weakly keeled, and those of the neck smooth; two loreals and one (anterior) canthal, the latter separated from the anterior loreal by a contact of the posterior loreal with the upper postnasal; belly spotted with brown; dorsal color a light brownish gray.

Description of the holotype: No postrostral; nasal separated from the rostral by the anterior internasals. Supranasals small, unexpanded. Frontonasal in narrow contact with the frontal between the prefrontals. Two superposed postnasals. Two loreals and one (anterior) canthal, the latter narrowly separated from the anterior loreal by a contact of the posterior loreal with the upper postnasal. One preocular; one subocular; four postoculars, the lowest quite small. Superciliary series incomplete posteriorly, comprising four elements on the left, only two on the right—the three anterior being fused into a single long element; the most anterior superciliary is not in contact with the prefrontal. Five medial and three lateral supraoculars, the posterior lateral in contact with the orbit. Frontal touching the interparietal. Four primary and four secondary temporals, the uppermost primary in contact with the uppermost secondary, and the lowest primary in contact with only the lowest secondary. Four temporal elements in contact with the supralabials. Supralabials nine on the left, ten on the right; infralabials eight. Postmental paired, followed by three large and one much smaller chin shields on each side, of which the members of the first pair are in contact along the mid-ventral line. Four or five sublabials, the anterior extending to the first chin shield and second infralabial.

Dorsals in sixteen longitudinal and forty-seven transverse rows; ventrals in twelve longitudinal and fifty-one transverse rows. A minimum of eight scales in any single row across the nape. The lateral rows of dorsals are smooth, the median eight rows weakly keeled except on the neck, where all of the scales are smooth. All scales of the limbs and those of the sides of the tail smooth or very weakly keeled.

A light brownish gray dorsally, each individual scale finely mottled brown and gray. Sides with somewhat irregular blackish vertical bars, bordered posteriorly with white; about 10-12 such bars between the axilla and the groin, the more posterior ones indistinct. A dark line from the nasal through the lower part of the eye onto the lower temporal region, bordered below by a very prominent light stripe. Ventral surface a very light gray or yellowish,

with many brown spots which tend strongly to be arranged in longitudinal lines along the middles of the scale rows, particularly medially. Chin and infralabials with numerous irregular small brown dots, the infralabial region not banded.

Measurements of the holotype are as follows:

Snout-vent	107 mm.	Axilla-groin	55 mm.
Tail regenerated		Fore limb	24 mm.
Head length	24.4 mm.	Hind limb	30 mm.
Head width	16.8 mm.	Fourth finger	7.1 mm.
Head depth	13.5 mm.	Fourth toe	11.3 mm.

Description of the paratype: This specimen agrees with the holotype except as here noted.

Frontonasal separated from the frontal by the prefrontals. Three postoculars. Superciliary series complete, comprising three elements on the left, four on the right; four lateral supraoculars on the left, three on the right, none of which are in contact with the orbit. Probably nine supralabials on each side, but because of an injury this number is not entirely certain. Seven infralabials.

Transverse rows of dorsals forty-five; ventrals in fifty-two transverse series.

Somewhat lighter in color than the holotype; each dorsal scale primarily gray, very finely dotted with brown.

Measurements of the paratype are as follows:

Snout-vent	97 mm.	Axilla-groin	47 mm.
Tail	130 mm.	Fore limb	21 mm.
Head length	21.2 mm.	Hind limb	27 mm.
Head width	15.3 mm.	Fourth finger	6.0 mm.
Head depth	12.8 mm.	Fourth toe	9.7 mm.

Remarks: This form is closely related to *B. g. gadovii*, from which it differs chiefly in the separation of the anterior loreal from the anterior canthal, the much less extensive carination, and the lighter color, with brown rather than black ventral spots; probably also in the possession of a slightly lower number of transverse dorsal scale rows. The difference in coloration might conceivably be due to differences in manner of preservation, but this seems very unlikely in view of the large number of *g. gadovii* seen, comprising series from several different collections; included in these are Guerrero specimens collected by Nelson and Goldman, the collectors of the types of *levigata*.

The close general resemblance between this form and typical *gadovii* makes a subspecific relationship appear more probable than a specific one.

Specimens examined: Oaxaca: Valley of Oaxaca (USNM 47212, holotype); "Mountains west of Oaxaca City" (USNM 47855, paratype). No other specimens are known.

Barisia modesta (Cope)

Pterogasterus modestus Cope, 1877, Proc. Amer. Philos. Soc., 17:97.
Gerrhonotus modestus, Günther, 1885, Biol. Centr. Amer., Rept.: 42.

Type and type locality: USNM 7084 (three specimens). The type locality is uncertain. Cope states, "The precise locality from which the specimens of this lizard were sent to the Smithsonian Institution is uncertain, but is probably Guatemala." Dr. Hobart Smith informs me that the tags on these specimens bear the datum "Veracruz," and has stated (1942) that the "type locality [is] apparently Orizaba, not Guatemala as guessed by Cope."

Range: Uncertain; the form is known only from the types.

Diagnosis: A *Barisia* of the *gadovii* group with frontonasal; supranasals expanded; dorsal scales of the body and neck nearly smooth; two (?) loreals, no canthals (?); dorsal color "brown . . . the sides are a reddish brown or maroon . . ."

Description: I have not seen this form, and all descriptions to be found in the literature are derived from Cope's original description, which is copied below. The bracketed comments are mine.

"Scales 10/12 [a misprint for 16/12, cf. Smith, 1942] slightly convex above, but not keeled, excepting those of the tail, which are strongly and obtusely carinate or ribbed; an azygous scute [post-rostral] between the two anterior pairs of internasals [anterior internasals and expanded supranasals]. Internasals of first pair reaching first labials. Internasals of third pair [posterior internasals] elongate, in contact with the frontonasals [prefrontals] behind, apparently including the small lateral interfrontonasals [anterior canthals?]. Two postnasals; a large plate, the anterior [posterior?] canthal, descends to the labials, from the inferior part of which a loreal may be separated. [I have not been able, from this description, to satisfy myself as to the exact arrangement of scales in this region.] Preoculars two or one. Two pairs of large infra-labials [postmentals and anterior chin shields] in contact, following the symphyseal, without a single postmental; two pairs follow, of which the anterior are separated by one scute. Lateral fold extending from ear to vent; the granular area extending above the humerus. Appressed limbs separated by six cross-rows of abdominal scales, or the length of the fore arm. Rows of scales from nape to origin of tail, forty-seven; do. from humerus to vent, thirty-eight.

"The tail is not very long and is grooved below as well as above. Total length, .150 [presumably meters, hence 150 mm.]; length to

meatus auditorius, .012; to vent, .072; length of hind leg, .019. Color above, brown; below, olivaceous. The sides are a reddish-brown or maroon, bordered above by a blackish line which separates it from the dorsal color.

"This species differs from all others of the genus 'Pterogasterus' in the extinction of the small plate [anterior canthal] which truncates the lateral angle of the interfrontonasal [frontonasal]. As a consequence of this, the latter has a diamond shape, as it does not reach the frontal plate behind nor the azygous plate in front. The smooth scales also separate it from all others of the genus.

"The precise locality from which the specimens of this lizard were sent to the Smithsonian Institution is uncertain, but is probably Guatemala."

Remarks: The relationships of this form are at present obscure, but the presence of a paired postmental, a postrostral and frontonasal have induced me to place it tentatively with the *gadovii* group. The fact that Cope placed it in the genus *Pterogasterus*, in which he otherwise included only *Gerrhonotus liocephalus* and related forms, would argue a general similarity to *liocephalus*; such a general similarity is also observable in *B. gadovii*. A better knowledge of the scalation and information regarding the skeletal anatomy would be of great assistance in definitely allocating this form.

Specimens examined: None; since it is known only from the types, there are no definite locality records for this form. [At this time (1944) the types are not available for study at the National Museum.]

Barisia antauges Cope

Barisia antauges Cope, 1866, Proc. Acad. Nat. Sci. Philad., 1866:132.

Gerrhonotus antauges, Sumichrast, 1882, La Naturaleza, 6:40.

Type and type locality: USNM; collected by Professor Sumichrast, from Orizaba, Veracruz.

Range: Known only from the type locality.

Diagnosis: A *Barisia* of the *gadovii* group without a frontonasal; supranasals expanded; dorsal scales of the body and neck nearly smooth; two (?) loreals, no canthals; ventral surface very heavily mottled; dorsal surface "dark brown, with a subdivided iridescence as though greased."

Description: As in the case of *modesta*, very little is known concerning this form. I have not seen the type, and all literature descriptions subsequent to Cope's, but excepting the very brief characterization in Smith's (1942) key, have been written by authors who considered *B. viridiflava* a synonym of *antauges*; their descrip-

tions actually apply to the former species. Again the best procedure seems to be to copy Cope's description, and again the bracketed comments are mine.

"A species differing from those already known in the entire smoothness of the scales of the body, while those of the tail are arranged in obtuse and strong ridges. Nuchal rows eight, those of the body 16/12. A depression along the vertebral line; six scales margin the vent. Labials 10/8, three last superior nearly equal, separated by four rows of nearly equal temporals from the parietals. Latter as broad as long, well separated, with the frontoparietals, by the elongate interparietal. Five supraorbitals, embracing three superciliaries [lateral supraoculars]. Prefrontals longer than broad; three pairs supranasals [anterior internasals, expanded supranasals, posterior internasals]. Head short and elevated. End muzzle to axilla 1 in. 3 l. [approx. 32 mm.]; latter to vent 2 in. 1 l. [approx. 53 mm., the snout-vent length thus approximating 85 mm.]; from latter to end of tail 4 in. 1 l. [approx. 103 mm.; it is probable that the tail has been injured].

"Above dark brown, with a subdivided iridescence as though greased, and with many small blackish brown spots, which are more distinct on the tail. Sides with about seventeen irregular vertical black bars from opposite nape to groin, each bordered with yellow specks behind. Front of ear and lips black, yellow varied; body and tail below, blackish, with very many yellowish-white specks.

"No. 11, Sumichrast's Coll. Stated by Prof. S. to be very rare."

Smith offers the further information that this form possesses a paired postmental.

Remarks: As in the case of *modesta*, further information is necessary before any definite conclusions can be drawn. The consistent confusion of *viridiflava* with this form might lead one to expect a strong general similarity between the two, but, with the exception of Cope himself, probably none of the authors who considered the two synonymous had seen any specimens of *antauges*. Smith, who had seen the type, recognized the distinctness of *viridiflava*. The paired postmental indicates a probable affinity with the *gadovii* group; the size of the type specimen is also more consistent with this group than with the smaller *moreleti* or larger *imbricata* group.

So far as can be definitely determined, *antauges* and *modesta* differ chiefly in the presence or absence of a frontonasal and post-rostral. If this be the case, and if *modesta* actually comes from Veracruz, there is a possibility that the two forms are identical.

Specimens examined: None; known only from Orizaba, Veracruz.

The *imbricata* group

Definition: *Barisia* with a paired postmental; nasal bones separated from each other by a broad contact between the frontal and premaxilla; pterygoid teeth vestigial; moderate to large forms, the maximum snout-vent length observed being 155 mm.; dorsal color brown, usually decidedly lighter than in other groups, and often without a dorsal longitudinal band; venter relatively light, sometimes suffused with gray, but not spotted or mottled over most of the surface; superciliary series incomplete posteriorly, sometimes anteriorly as well; no upper postnasal; usually a single (posterior) loreal, which may have a cantal split off dorsally (a small anterior loreal is also present in *rudicollis*); frontonasal and postrostral absent; lateral fold very well developed.

Range: Oaxaca and Veraacruz northward to Chihuahua and Coahuila.

Discussion: In occasional specimens there is a partial fusion of the postmental elements, but this is rarely complete; the resulting scute is decidedly asymmetrical and obviously different from the symmetrical unpaired postmental of the *moreleti* group. The frontopremaxillary contact is broad, much broader than in *gadovii*. The pterygoid teeth are poorly developed and few in number, but close examination shows their constant presence; only occasionally do any protrude through the mucous lining of the roof of the mouth.

Although interspecific size differences are present, the average adult size of every form is greater than for any member of either of the other groups; the more northern forms are the largest. The dorsal color is a nearly uniform brown or tan in males of all forms excepting *rudicollis*. In that species, and in females of certain races of *imbricata*, a dorsal longitudinal band and lateral dark bars are present, much as in the other groups. The ventral surface tends to be uniformly light medially, but dark markings are frequently found laterally. There is never the heavy spotting or mottling of the belly frequently found in the other groups.

The superciliary series is without exception incomplete posteriorly (see discussion of this feature in connection with the *moreleti* group); often the anterior portion is also reduced or lacking, so that in some cases only a single element remains. Never does the series comprise more than four elements.

The upper postnasal is lacking, the supranasal and lower postnasal usually being in contact at the posterodorsal angle of the nasal. The supranasal is always present, never expanded. The

loro-canthal group usually consists of a single large cantholoreal element, with occasionally a canthal split off from the dorsal portion; in *rudicollis* a small anterior loreal is also present. The frontonasal is normally lacking; rarely it occurs as a very small plate wedged between the posterior internasals and prefrontals. The postrostral is always absent.

The dorsal osteoderms are heavy and moderately rugose. They possess a strong, but usually obtuse, median keel and a strongly thickened basal portion. The lateral fold is well developed, containing a granular area more than equivalent to one lateral scale row in width. The side of the neck often contains a rather well-defined dermal pocket.

This group is the most highly modified of all Gerrhonotinae, with the possible exception of some *Abronia*. Among the more important specializations are included the consistent absence of the frontonasal, consistent strong reduction of the loro-canthal group, reduction of the superciliary series, loss of the upper postnasal, and a broad fronto-premaxillary contact. Other specializations are shared with only a few other groups.

Barisia rudicollis (Wiegmann)

Plate I

Gerrhonotus rudicollis Wiegmann, 1828, Isis, 1828, no. 3:380.

Barisia rudicollis, Gray, 1838, Ann. Mag. Nat. Hist., ser. 1, 1:390.

Tropidogerrhonotus rudicollis, Fitzinger, 1843, Syst. Rept.: 21.

Barissia rudicollis, Gray, 1845, Cat. Spec. Liz. Coll. Br. Mus.: 55.

Type and type locality: Berlin Museum. Type locality given only as "Mexico," but is probably México (state).

Range: Except for the types the form is known only from a single specimen, first reported by Martín del Campo (1939), from the Hacienda La Gavia, in the state of México.

Diagnosis: A *Barisia* of the *imbricata* group with fourteen rows of ventrals; two loreals, no canthals; nasal in contact with the rostral; fewer than 33 transverse rows of dorsals; fourteen longitudinal rows of dorsals; anterior superciliary present, moderately large.

Description: Nasal in contact with the rostral below the anterior internasals. Two loreals, the anterior small, the posterior large, in contact with the prefrontal; no canthals. Postnasal in very narrow contact with the supranasal, or separated from it by a contact of the anterior loreal with the nasal, widely separated from the posterior internasal. Four superciliaries, the anterior separat-

ing the preocular from the first medial supraocular; the first superciliary large, its contact with the (posterior) loreal greater than that of the first medial supraocular with the loreal. Two or three suboculars; four postoculars. Four primary and four secondary temporals, the uppermost primary in contact with the uppermost secondary, the lowest primary with the two lower secondaries and with the penultimate and antepenultimate supralabials. Supralabials 10-12; infralabials 8-9. Postmental paired, followed by three large and one or two smaller pairs of chin shields, of which the members of the first pair are in contact along the mid-ventral line. The sublabials extend anteriorly to the first chin shields and second infralabials.

Dorsals in fourteen longitudinal and about 27-29 transverse rows; ventrals in fourteen longitudinal and about forty-seven transverse series. All but the lateral rows of dorsals are at least lightly keeled, the median eight rows very prominently so. The occipital, interparietal and upper temporals are also keeled. Six longitudinal rows of scales across the nape, all strongly keeled.

Dorsum a grayish brown; sides with prominent but very irregular vertical black bars bordered posteriorly with white; these white markings are continued across the back as very indistinct light bands. Dorsum of head brownish flecked with white, lighter laterally, the labial and lower temporal regions cream colored. Rostral and each of the anterior supralabials with a narrow black stripe along their posterior borders. A black stripe across the preoculars and suboculars to the antepenultimate supralabial, at the anterior border of which it bends down sharply to the lip. Venter whitish with irregular, prominent black markings laterally.

Measurements of the single example seen are:

Snout-vent	105 mm.	Axilla-groin	51 mm.
Tail—tip broken off		Fore limb	28 mm.
Head length	25.4 mm.	Hind limb	34 mm.
Head width	18.5 mm.	Fourth finger	8.3 mm.
Head depth	14.2 mm.	Fourth toe	11.4 mm.

Remarks: Although certainly a member of the *imbricata* group, this form differs widely from all others in the group. It is probably an early, but in some respects highly specialized, derivative of the ancestral stock of this group. The fourteen rows of ventrals, two loreals, four superciliaries and extensive carination are regarded as primitive features indicating an early derivation. The low number of transverse dorsal scale rows, the naso-rostral contact, and distinctive color pattern are thought to be modifications peculiar to this form.

Nothing is known concerning the habitat of this form, but there are some indications that it may be arboreal—in contrast to all other members of the genus. The lichen-like color pattern is strongly suggestive of arboreal habits. The limbs are relatively long; only this form of all the *Gerrhonotus-Barisia-Elgaria* complex is comparable to the arboreal *Abronia* in relative limb length. The fact that a form with such a large number of primitive features would continue to exist so near the generic center of dispersal might be taken as an indication that this form occupies a different habitat than its more highly modified relatives. Even the rarity of specimens in museum collections lends credibility to the hypothesis that it is arboreal. This same paucity has been characteristic of all members of the genus *Abronia* until very recently, that is, until it was discovered that they are primarily tree-dwelling forms.

Specimens examined: México (state): Hacienda de la Gavia (IBM, one specimen). No other specimens with definite locality data are known.

Barisia imbricata imbricata (Wiegmann)

Gerrhonotus imbricatus Wiegmann, 1828, Isis, 1828, no. 3: 381.

Gerrhonotus lichenigerus Wagler, 1830, Ieon. Amph.: Fasc. II, pl. 24, fig. 2. (Type locality: México.)

Gerrhonotus adspersus Wiegmann, 1834, Herp. Mex.: pl. 10. (Type locality: Mexico [by inference].)

Barisia imbricata, Gray, 1838, Ann. Mag. Nat. Hist., ser. 1, 1: 390.

Barisia lichenigerus, Gray, 1838, *ibid.*: 390.

Barissia imbricata, Gray, 1845, Cat. Spec. Liz. Coll. Br. Mus.: 55.

Barissia lichenigera, Gray, 1845, *ibid.*: 55.

Gerrhonotus olivaceus Baird, 1859, Proc. Acad. Nat. Sci. Philad. for 1858: 255. (Type locality: México [erroneously stated by Baird as "near San Diego, Calif.].")

Barissia olivacea, Cope, 1875, Bull. U. S. Nat. Mus., 1: 46.

Gerrhonotus [imbricatus] imbricatus, Dunn, 1936, Proc. Acad. Nat. Sci. Philad., 88: 475.

Gerrhonotus imbricatus adspersus, Smith, 1942, Proc. U. S. Nat. Mus., 92, no. 3153: 368.

Type and type locality: Berlin Museum, the type locality is given only as "Mexico."

Range: Central México (state), the Distrito Federal and Morelos, westward into Michoacán, eastward to Veracruz and southward to central Oaxaca; northward into southern Hidalgo and probably southern Guanajuato.

Diagnosis: A *Barisia* of the *imbricata* group with twelve rows of ventrals; one loreal and no (occasionally one) canthals; nasal usually separated from the rostral by the anterior internasals; 34-42 transverse and usually 14, sometimes 12, longitudinal rows of dorsals; dorsal color light brown, females with darker brown cross bands, or lateral bands plus mid-dorsal blotches; coloration of venter variable; first superciliary present, moderate in size, usually separating the preocular from the first medial supraocular; lowest

primary temporal in contact with the penultimate and antepenultimate supralabials.

Description: Nasal normally separated from the rostral by the anterior internasals. One loreal, in contact with the prefrontal, rarely with a canthal split off dorsally. Postnasal in rather broad contact with the supranasal, widely separated from the posterior internasal. Generally three superciliaries, the anterior usually separating the preocular from the first medial supraocular; the anterior superciliary is of moderate to small size, its contact (if any) with the loreal usually shorter than the contact of the first medial supraocular with the loreal. Two or three suboculars; three, rarely four, postoculars. Four primary and four secondary temporals, the uppermost primary in contact with the uppermost secondary, the lowest primary in contact with the two lowest secondaries and with the penultimate and antepenultimate supralabials. Supralabials 9-11, usually ten; infralabials 6-9. Postmental paired, followed by three large pairs and one smaller pair of chin shields, of which the members of the first pair are in contact along the mid-ventral line. The sublabials extend anteriorly to the first chin shields and second infralabials, occasionally to the postmental.

Dorsals in fourteen longitudinal rows, frequently only twelve in specimens from the Distrito Federal and westward; 34-42 (ave. 39.3) transverse rows. Ventrals in twelve longitudinal and 50-58 (ave. 55.1) transverse series. Caudal whorls 91-108 (ave. 100.5). The median six or eight rows of dorsals strongly keeled, with one or two lateral rows more weakly keeled.

Tan to brown above, males nearly uniform or with a few small scattered white spots. Females with dark brown vertical bars on the sides, sometimes bordered posteriorly with white; a corresponding series of mid-dorsal dark blotches, frequently expanded into bars more or less confluent with those of the sides. Ventral color yellowish to dark gray, darker laterally than medially. There is no mottling or prominent spotting, but in a few specimens there is a tendency for the dark color to form transverse lines between the scale rows. Infralabials and sublabials usually rather dark, but chin shields usually light excepting in specimens from Veraacruz and northern Puebla. Females from the western part of the range may have a color pattern similar to that of the male, with the dark bars very indistinct or lacking.

These are moderately large lizards, adults averaging about 110 mm. in snout-vent length, the maximum observed being 126 mm.

Tail about 1.35-1.50 times the snout-vent length, slightly longer in the younger specimens than in the older ones.

Remarks: The species *imbricata* is well defined and readily distinguishable from both *rudicollis* and *levicollis*, though more closely related to the latter. Probably the most convenient character is the number of transverse dorsal scale rows, 34-45 in *imbricata*, below 33 in *rudicollis*, and above 45 (with a single known exception) in *levicollis*. Geographic races within the species are, however, not so easily determined; only one such race (*i. ciliaris*) is really well defined. In the case of variants found near the periphery of the known range, especially where the boundary of the known range probably represents a boundary of an area worked by collectors rather than a boundary of the true range of the animal, the question of whether or not truly subspecific populations are represented by the known specimens cannot be definitely answered at present. Specific cases of this sort will be mentioned subsequently.

The majority of known specimens of *i. imbricata* are from the vicinity of the Distrito Federal, but I do not believe these are entirely typical of the subspecies. The typical populations inhabit eastern México and Morelos, southern Puebla, and northern Oaxaca. These specimens all have fourteen dorsal scale rows, uniformly light chin shields, no canthal, and an anterior supereiliary which, while not large, separates the preocular from the first medial supraocular.

Specimens from western México and Michoacán represent a peripheral population of the type mentioned above. For this population Dr. Hobart M. Smith recently (1942) revived the name of *adpersa* Wiegmann, 1834. With his permission, I offer the following comments, taken from his unpublished notes, which he has kindly allowed me to make use of: "*G. adpersus* generally has been considered a synonym of *imbricatus*. It appears that Wiegmann was at the point of describing it when Wagler published the description of *lichenigerus*. Wiegmann concluded that his *adpersus* was a synonym of *lichenigerus*, and so treated it in his *Herpetologia Mexicana* (1834). However, a figure of the head plates of *adpersus* was published, under that name, in the latter work. The figure shows that the nasal is broadly in contact with the rostral, a condition which very rarely occurs in *imbricatus*. Wiegmann's description of *lichenigerus*, probably based solely upon his type of *adpersus*, states that the longitudinal series of dorsals number 12." Smith had available a single specimen from western México (state); this specimen has twelve dorsal scale rows and the nasal in contact with the rostral, agreeing in these respects with *adpersa*, and in

view of the extremely small probability of finding these two characteristics together on the basis of pure chance, concluded that a western subspecies exists to which the name *adspersa* is applicable. I have since had the opportunity to examine one more specimen from western México and three from Michoacán, making a total of five specimens from the presumed range of this questionable form. Of these, two possessed a full fourteen scale rows; only the one showed a naso-rostral contact (a condition seen on only one side of one individual from any other part of the range of *imbricata*), although in another the separation was decidedly narrower than usual; three of the five had a canthal split off from the loreal on at least one side—another condition rarely found in specimens from the central part of the range and also exhibited in Wiegmann's figure of *adspersa*. In one female specimen the transverse bands are indistinct, in the other (three are males) these bands are indiscernible, indicating a possibility of a lesser sexual dimorphism in color pattern than in the typical population. The occurrence of all these variants certainly shows that this western population is atypical, but, on the basis of the few specimens available, none show a high enough percentage of occurrence to allow definition of a recognizable subspecies in this area; it may simply be a case of "peripheral variation." I therefore consider it best for the present to continue to consider *adspersa* as a synonym of *imbricata*. By this I do not imply that I do not believe it quite possible that a recognizable subspecies is represented, but that present specimens are insufficient to demonstrate the existence of such a subspecies, or to provide a diagnosis. If further collection shows that this population is demonstrably subspecifically distinct, the name *adspersa* would probably be correctly applied to it. It should be mentioned here that a relatively large number of specimens from the Distrito Federal and vicinity have only twelve dorsal scale rows, and might in this respect be thought of as "intergrades."

A series from Cruz Blanco, Veracruz, has the preocular and first medial supraocular in contact in about 60% of the specimens, and the chin shields are gray or marked with gray in all adults. Specimens from Orizaba and Acultzingo to the south and Teziutlan, Puebla, to the northwest, exhibit these same features to a lesser degree. Although this geographic variant is well marked, I do not believe that the proposal of a new subspecific name is warranted, terming, as would be necessary if such a course were followed, the Acultzingo-Orizaba and Teziutlan populations as intergrades between the Cruz Blanco and typical forms.

Specimens examined: Distrito Federal: Near Ajusco (AMNH 15486); Chiribuseo (MCZ 28377); near Guadalupe (AMNH 15483); near México (city) (EHT-HMS 10406); near San Juanico (AMNH 15484-15485); San Juan Teotihuacan (MCZ 6345, 4 spec.).

México: Desierto de los Leones (EHT-HMS 10398-10401); Lake Lerma (EHT-HMS 19144-19145); Llano Grande (EHT-HMS 23838-23840, USNM 113213); Nevado de Toluca (EHT-HMS 22218-22219, 23808-23809, 23836-23837; USNM 113219); San Martín (EHT 10396); Villa Victoria (USNM 113215); Zempoala (USNM 113209-113212).

México or Morelos: Lake Zempoala (EHT 10402-10404; 10426, 19133-19136); Monte Río Frío, 45 km. ESE of México (city) (TAM 711, 738-743); 55 km. SE of México (city) (TAM 911-918); 45 km. SW of México (city) (TAM 919-920).

Michoacán: Mount Tancitaro (USNM 47787, UMMZ 94411); 10 km. Northwest of Zacapu (UMMZ 94412).

Morelos: Tepoztlán (EHT-HMS 28870); near Tres Marias (EHT-HMS 10422).

Puebla: Cacoloapam (EHT-HMS 10397); Teziutlán (EHT-HMS 23841-23846); Popocatepetl (EHT-HMS 19137, 23807); Río Otlati, 15 km. NW of San Martín (TAM 901).

Veracruz: Acultzingo (USNM 113204-113208, EHT-HMS 28871-28878); Cruz Blanco (EHT-HMS 10405, 10407-10417, 10423-10425, 10427); Otizaba (EHT-HMS 19138-19139, USNM 7087, 2 spec., 19262, 47774); 4 km. S of Jalacingo (Univ. of Kansas, uncatalogued).

Hidalgo: El Chico National Park (EHT-HMS 19141); San Miguel (MCZ 11434); Tianguistengo (EHT 23848); Zaualtipán (EHT-HMS 19142, 23847).

Oaxaca: Reyes (USNM 47392); Zempoaltepec (?) (47189-47191).

Indefinite or extremely doubtful localities: USNM 3088, 7036, 8317, 26165, 32166; AMNH 19304, 24760-24763.

A total of 128 specimens. The form is also reported from Palambá, Michoacán; Cuernavaca, Morelos; and Nevado de Colima, Jalisco, the last not certainly referable to this form.

Barisia imbricata ciliaris (Smith)

Gerrhonotus leucicollis ciliaris Smith, 1942, Proc. U. S. N. M., 92, no. 3153: 365.

Type and type locality: USNM 47496; from Sierra Guadalupe, Coahuila.

Range: Hidalgo and Guanajuato northward to Chihuahua and Coahuila.

Diagnosis: A *Barisia* of the *imbricata* group with twelve rows of ventrals; one loreal, usually no canthal; nasal separated from the rostral; about 39-45 transverse and usually sixteen longitudinal rows of dorsals; dorsal color a nearly uniform light brown above in both sexes, often spotted with white; venter light; first superciliary moderate or large, separating the preocular and first medial supraocular; lowest primary temporal in contact with the penultimate and antepenultimate supralabials.

Description: Nasal separated from the rostral by the internasals. One loreal; normally no canthals; postnasal in rather broad contact with the supranasal. Three superciliaries, the anterior normally separating the preocular from the first medial supraocular; first superciliary moderately large, its contact with the loreal usually about equal to the contact of the first medial supraocular with the loreal. Two suboculars; three postoculars. Four primary and four secondary temporals, the uppermost primary in contact with the uppermost secondary, the lowest primary in contact with the

two lowest secondaries and with the penultimate and antepenultimate supralabials. Supralabials 9-11; infralabials 8-10. Postmental paired, followed by three large pairs and one smaller pair of chin shields, of which the members of the first pair, occasionally also the second, are in contact along the mid-ventral line. The sublabials usually extend anteriorly to the first chin shields and second infralabials, frequently to the postmental, less commonly to the first infralabial.

Dorsals usually in sixteen longitudinal and 39-45 (ave. 41.3) transverse rows; Smith records a single specimen with 49 transverse rows, but I have seen none with more than 45. Ventrals in twelve, occasionally fourteen, longitudinal and 53-61 (ave. 57.8) transverse rows. Caudal whorls 87-102. The median six or eight rows of dorsals are keeled.

A nearly uniform light brown above, often with a reddish or yellowish cast; small scattered white spots often present. Venter uniformly light except laterally, where it may be slightly darkened.

These are large lizards, adults averaging about 120 mm. in snout-vent length; the maximum observed is 145 mm. Tail about 1.30-1.60 times the snout-vent length.

Remarks: This form is distinguished from *i. imbricata* by the larger number of dorsal scale rows, both transverse and longitudinal, by the color pattern (particularly that of the female), and to a lesser extent by the larger first supereiliary. This is also a definitely larger race.

A female specimen from Atotonilco Grande, Hidalgo resembles *i. imbricata* in scalation, but has the uniform color of *ciliaris*. Other southern Hidalgo specimens resemble *i. imbricatus* in all respects, while a specimen from northern Hidalgo is typical of *ciliaris*. A subspecific relationship between the two forms, with intergradation occurring in central Hidalgo, appears probable.

A female specimen (LSU R28) has an unpaired postmental; four of ten embryos contained in the uteri have this same rare condition.

Specimens examined: Durango: Inde (USNM 46843).

Guanajuato: San Felipe (EHT-HMS 10418-10421).

Hidalgo: Durango (EHT-HMS 23803). *ciliaris* x *imbricata*, Atotonilco Grande (EHT-HMS 19140).

Nuevo León: Pablillo, Galeana (EHT-HMS 19131).

San Luis Potosí: No further data (MCZ 4547, 8339); near Jesus Maria (USNM 47207-47210); between Llano de Coneja and Llano de Garzas, 7,000 ft. (R28 Louisiana State Univ.).

Sinaloa: Esquinapa (AMNH 585).

A total of sixteen specimens. Other locality records are: Sierra Guadalupe, Coahuila; Coyotes, Durango; Sierra de Santa Rosa, Guanajuato; Sierra Madre, Zacatecas.

Barisia imbricata planifrons (Bocourt)

Gerrhonotus (Barissia) planifrons Bocourt, 1879, Miss. Sci. Mex., Rept., livr. 6: 361.

Gerrhonotus planifrons, Günther, 1885, Biol. Centr. Am., Rept.: 38.

Barissia planifrons, Cope, 1887, Proc. Amer. Philos. Soc., 17: 97.

Type and type locality: A presumably young specimen in the Paris Museum; the type locality is given only as "Oaxaca."

Range: Uncertain, but probably southern Oaxaca; typical *i. imbricata* is known from Reyes, and two specimens from Cerro San Felipe are thought to be *imbricata* \times *planifrons* intergrades.

Diagnosis. A *Barisia* of the *imbricata* group with twelve rows of ventrals; one loreal and usually no canthal; nasal separated from the rostral; about 35-39 transverse and sixteen longitudinal rows of dorsals; coloration as in *i. imbricata*; first superciliary relatively large, separating the preocular and first medial supraocular; lowest primary temporal in contact with only the antepenultimate supralabial.

Description: The following description applies to the type specimen, as described and figured by Bocourt.

Nasal separated from the rostral by the anterior internasals. One loreal; no canthal; postnasal slightly separated from the supranasal by a naso-loreal contact. Three superciliaries, the anterior separating the preocular and first medial supraocular; it is of large size, its contact with the loreal greater than the contact of the first medial supraocular with the loreal. Two suboculars; three postoculars. Four primary and four secondary temporals, the uppermost primary in contact with the uppermost secondary, the lowest primary in contact with the two lowest secondaries and with the antepenultimate, but not the penultimate, supralabial. Supralabials ten; infralabials eight or nine. Postmental paired, followed by three large pairs and one smaller pair of chin shields, of which the members of the first pair are in contact along the mid-ventral line.

Dorsals in sixteen longitudinal and about thirty-five transverse rows; ventrals in twelve longitudinal rows. The median eight rows of dorsals are strongly keeled.

Color pattern apparently similar to that of *B. i. imbricata*.

Remarks: Two specimens from Cerro San Felipe, Oaxaca, agree with the above description except as follows: One specimen has a canthal split from the dorsal portion of the loreal on one side; supranasal and postnasal in contact in both; in one the lowest primary temporal is in contact with the penultimate supralabial; dorsals in sixteen longitudinal rows in one, fourteen to fifteen in the other; ventrals in 53 and 54 transverse rows.

Though these specimens are not entirely typical of *planifrons* as described above, they do resemble the type specimen of that form in certain features. I have therefore tentatively assigned them to the category of *imbricata* \times *planifrons*, assuming that a population to which the name *planifrons* is applicable actually exists somewhere south of Cerro San Felipe.

In many respects this form resembles *ciliaris* more closely than it does typical *imbricata*, but differs in the lower number of transverse dorsal scale rows and in the fact that the lowest primary temporal is not in contact with the penultimate supralabial, probably also in color pattern.

Specimens examined: Oaxaca: Cerro San Felipe, *planifrons* \times *imbricata* intergrades (EHT-HMS 19132, 19143). No other specimens known with definite locality data.

Barisia levicollis Stejneger

Barisia levicollis Stejneger, 1890, Proc. U. S. Nat. Mus., 13, no. 809: 184.

Gerrhonotus imbricatus levicollis, Dunn, 1936, Proc. Acad. Nat. Sci. Philad., 88: 475.

Gerrhonotus levicollis levicollis, Smith, 1942, Proc. U. S. Nat. Mus., 92, no. 3153: 368.

Type and type locality: USNM 9362; said to be from the "Mexican boundary," probably from central Chihuahua.

Range: Known only from central and southern Chihuahua.

Diagnosis: A *Barisia* of the *imbricata* group with twelve rows of ventrals; one loreal and no canthal; nasal separated from the rostral; forty-six or more transverse and sixteen longitudinal rows of dorsals; uniform light brown above, with or without small scattered white spots; venter light, often with black spots laterally; a single (middle) superciliary, the preocular in contact with the first medial supraocular; lowest primary temporal usually in contact with only the antepenultimate supralabial.

Description: Nasals separated from the rostral by the anterior internasals. One loreal, often separated from the prefrontal by a contact of the first medial supraocular with the posterior internasal; no canthals. Postnasal in rather broad contact with the supranasal, usually also with the posterior internasal. Only a single superciliary present, corresponding to the most posterior element of this series in *imbricata*; the preocular therefore in contact with the first medial supraocular, and usually also with the first lateral supraocular. Two suboculars; two postoculars, the upper quite large, the lower very small. Four primary and four secondary temporals, the uppermost primary in contact with the uppermost secondary, the lowest primary in contact with the two lowest secondaries and with the antepenultimate but not the penultimate supralabial. Supralabials 9-11; infralabials 6-9. Postmental paired, followed by three

large pairs and one smaller pair of chin shields, of which the members of the first pair are in contact along the mid-ventral line. The sublabials extend anteriorly to the first chin shields, occasionally the postmental, and the second infralabials.

Dorsals in sixteen longitudinal and 45-51 (ave. 47.8) transverse series; ventrals in twelve longitudinal and 57-64 (ave. 61.0) transverse rows. Caudal whorls 99 and 102 in two specimens with undamaged tails. The median six or eight rows of dorsals are keeled, but not so strongly as in *imbricata*.

Both sexes a uniform tan above, occasionally with small scattered white spots. Venter nearly uniform yellowish or light gray, usually with small blackish spots laterally.

This is the largest form of the genus, adults averaging about 125 mm. in snout-vent length; the observed maximum 157 mm. Tail about 1.4 times the snout-vent length.

Remarks: Despite the fact that in certain respects *ciliaris* is intermediate between *i. imbricata* and *levicollis*, the latter is possessed of so many unique characters that I have chosen, pending further information, to consider it specifically distinct. The range of *levicollis* within Chihuahua is not known, since most of the specimens bear incomplete locality data, but it certainly extends as far south as Batopilas. All of the specimens I have seen are typical *levicollis*, with no tendency towards *ciliaris*. A single specimen of *ciliaris* with the only locality data being "Chihuahua" is completely typical of that form. Thus while there is no positive evidence of any overlap in the ranges of these two forms, there is at least some indication that such an overlap may occur. The Chihuahua-Durango border region would appear to be the critical area for the solution of this problem.

Specimens examined: Chihuahua: No further data (AMNH 1945, USNM 26603); "north Chihuahua" (AMNH 592-594); Colonia Garcia (MCZ 6977); Meadow Valley (USNM 26602, 26612); 65 miles east of Batopilas (USNM 47413).

A total of nine specimens. Also reported from Samachique, Chihuahua.

GENERAL REMARKS

I have previously (American Midland Naturalist) pointed out that the *Barisia-Gerrhonotus-Elgaria* ancestral stock probably inhabited the northern Mexican plateau region in the lower Oligocene, and postulated possession by this stock of the following characteristics: Skull similar to that of *Elgaria*; dorsal osteoderms as in *Barisia*; cephalic scutellation much as in *Gerrhonotus l. infernalis*; body scales moderately numerous, extensively carinated, much as in *Barisia moreleti*; general color pattern similar to that of *Barisia moreleti* and *Elgaria c. coerulea*, i. e., a longitudinal light band dorsally and black white-tipped scales laterally, irregularly arranged; belly rather strongly mottled; postero-ventral surfaces of forearms and shanks nearly agranular; tail moderate in length.

One section of this stock became modified at the center of dispersal; the pterygoid teeth were reduced, there was some reduction of the loreo-canthal group of head plates, and the posteroventral surfaces of the forearms and shanks became more granular. These and other minor modifications produced a "*Barisia* prototype" stock in this central area. Continued modification in and southward migration from this area produced the present arrangement of forms within the genus *Barisia*, as discussed in the subsequent paragraphs. There was no northward migration of *Barisia* from this region, but the establishment of a proto-*Elgaria* stock in the Chihuahua-Sonora region is probably an integral part of the same general outward movement as the southward migration of the early *Barisia*.

As indicated, the *Barisia* prototype was similar in many respects to *B. m. moreleti*, but with certain important exceptions. The pterygoid teeth, though probably in the process of reduction, had not been completely lost; the internasal, frontonasal, and prefrontal elements were all moderately developed; a postrostral was present, at least in a certain proportion of this stock.

Certain specializations appeared in the population near the center of dispersal, while forms retaining the more primitive characters migrated southward. The first migrant group crossed the Isthmus of Tehuantepec, becoming established south of that barrier, but the movement did not proceed beyond northern Central America at that time; this may have been due to an inability to overcome the barrier constituted by the southern Nicaragua lowlands. That area was submerged in the early and middle Miocene, but complete submergence was probably not necessary to form an effective barrier.

The single postmental, characteristic of the *moreleti* group, was probably developed during the period of southward movement, since

it is found in *viridiflava*. This species is thought to have originated from a portion of the group which survived north of the Isthmus, rather than one which re-entered the area from the south. The only specialized group characters in which it agrees with the southern members are the complete lack of pterygoid teeth and the possession of an unpaired postmental. The usual absence of a frontonasal and the frequent occurrence of a postrostral indicate that separation from the remainder of the group took place before the modifications affecting these elements in the rest of the group occurred. Moreover, a large number of modifications are found in *viridiflava* but not in the more southern members of the group; this might also be taken as evidence for a long period of isolation of this species.

The Guatemala-Nicaragua section developed an enlarged frontonasal and lost the postrostral; these modifications are common to all races of *moreleti* (and also to *monticola*). In different parts of the range the minor modifications appeared which differentiate the existing subspecies of *moreleti*, as have been mentioned in the text.

The entrance of members of this group into southern Central America was subsequent to the establishment of the species *moreleti* in the north, rather than an integral part of the original southward movement. All of the specializations common to all races of *moreleti* are also to be found here, in addition to those others which have appeared subsequent to separation from the northern group. These latter include particularly a modification of the color pattern and a reduction of the number of longitudinal dorsal scale rows. The number of transverse dorsal rows is also somewhat reduced, and the supranasal has been lost in a large proportion of the population.

The second group moving southward from the dispersal center differed in a number of respects from the first. Here again the pterygoid teeth were completely lost, but the postmental in this case remained paired. The color pattern was slightly modified, the dark, usually white-tipped, scales of the sides being arranged into definite, more or less regular, vertical bars, which were sometimes continued across the back. A fronto-premaxillary contact developed in the skull; the number of longitudinal dorsal scale rows was reduced to sixteen, and the general size increased slightly. All of these modifications, with the exception of the complete loss of the pterygoid teeth, must have occurred in the original center of dispersal, rather than during the course of migration, since they are shared by this group and the succeeding one which originated from that center.

This second migrant group, the prototype of the *gadovii* group, pushed southward to the Isthmus of Tehuantepec but failed to cross

that barrier. It has since been obliterated everywhere except for a small area in southern Guerrero and northern Oaxaca, and another limited area in Veracruz. The Guerrero form, *B. g. gadovii*, is thought to resemble very closely the original migrant population, although there is a loss of certain elements, such as the postrostral, from a large percentage of the population. The Oaxacan *g. levigata* shows only minor modifications of coloration and scalation. The Veracruz group reduced the number of loreo-canthal elements, expanded the supranasals, and in the case of *antauges* presumably lost the frontonasal.

The population remaining at the center of dispersal, in contrast to these two major migrant groups, retained pterygoid teeth in a vestigial condition. Numerous modifications in scalation appeared, in addition to those shared with the *gadovii* group. The posterior superciliaries, frontonasal, upper postnasal and postrostral were all lost. The granular area of the lateral fold was decidedly enlarged. The entire color pattern was greatly lightened. The loreo-canthal group was reduced to probably two loreals and a single (posterior) canthal on each side. There was also a general increase in size.

A portion of this population became somehow isolated at a relatively early date, yet without being geographically far removed from the center of dispersal. This particular form, *rudicollis*, became highly specialized in several respects, *e. g.*, the great reduction in number of transverse dorsal scale rows, but the retention of the anterior loreal and of four superciliaries indicate that it is an earlier derivative of the *imbricata* stock than are other existing members of the group. The early distribution of this form may have been somewhat different than at present, but evidence has been presented that its early isolation may have been ecological rather than geographical.

In the central population the number of superciliaries was reduced to three and the anterior loreal lost. Some such form as this spread over most of México south to, or nearly to, the Isthmus of Tehuantepec. In the central to southern part of that range the anterior superciliary was somewhat reduced and the number of dorsal scale rows reduced to fourteen. These two features spread throughout most of the region south of 21 degrees latitude, except for a small area in Oaxaca where *planifrons* presumably occurs. In the western part of that area the number of dorsal scale rows has been further reduced to twelve in a sizable percentage of the population, and the anterior canthal perhaps retained in a relatively large proportion. Throughout the remainder of the range, including the area north of 21 degrees, the canthal was lost in the majority of the population.

Roughly north of 21 degrees these changes did not occur, except that in *ciliaris* the number of transverse rows of dorsals may have decreased slightly. The northern forms are definitely larger than the southern, probably larger than the early widespread population. In addition, the dark transverse bars have been lost in both sexes.

In Chibualua the high number of transverse dorsal rows was retained. As in all the northern group, the dark bars were lost in both sexes and the size presumably increased. Other modifications have occurred here, the most obvious being the reduction of the superciliary series to a single element. Others include the usual contact of the posterior internasals with the postnasals, and often also with the first medial supraoculars.

Although all forms of this genus are found only at relatively high altitudes, it appears that members of the *moreleti* group regularly occupy somewhat higher altitudes, on the average, than do members of either of the other groups. Certain characteristics of that group should be pointed out as probable correlatives of that fact. Firstly, the individuals in this group are decidedly smaller than are representatives of the other two groups. Secondly, this group is more heavily and darkly pigmented than the other groups, the difference from the *gadovii* group, however, being much less pronounced than that from the *imbricata* group. This dark coloration and small size are frequent characteristics of poikilothermous forms found at high altitudes (or northern latitudes), the presumption being that these features allow more efficient utilization of radiant heat from the sun, the dark pigment increasing the absorptive capacity of the surface and the small size producing a greater surface area relative to the mass of the body. Thirdly, it seems probable that the *moreleti* group is ovoviviparous, the other groups may or may not be. I know of no direct observations on this point for any of the forms concerned, but eggs have been observed in the uterus of female specimens of the *moreleti* group with embryos up to 26 mm. in length; it is therefore obvious that considerable development takes place while the egg remains in the uterus, and it is probable that the young are born alive. In the other two groups, well-developed embryos were found only in *B. i. ciliaris*; fully matured eggs were frequently found in other forms, but no recognizable embryos were ever observed. In both *gadovii* and *i. imbricata* a series of specimens taken at the same time (approximately) contained females with mature eggs and one or more females in which the uterus was empty and had a deflated appearance, indicating that oviposition had recently occurred. This would indicate an oviparous habit for these forms.

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